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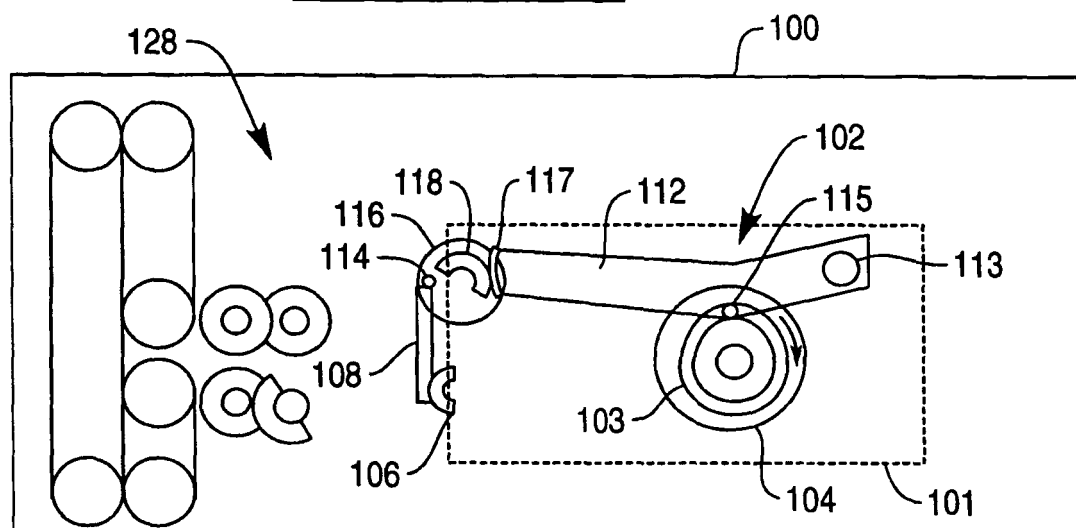
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(54) **Pick mechanism**

(57) A pick mechanism for picking sheet media comprising control circuitry, a motor and a pick means, wherein the motor is arranged to move the pick means such that it can pick sheet media and the control circuitry is

arranged to determine a pick action and to control the motor such that the pick means follows the determined pick action. The pick mechanism may be for use in an Automated Teller Machine, in which case the sheet media comprises currency notes.

FIG. 1
PRIOR ART



Description

[0001] This invention relates to a pick mechanism for use in handling sheet media, in particular but not exclusively sheet media including paper media such as currency notes.

[0002] Pick mechanisms for transferring sheet media are known. A prior art example is shown in Figure 1 and comprises one or more suction cups mounted on a pivoting arm. The suction cup is brought into contact with the sheet media (usually the top sheet of a stack of sheet media), a vacuum is applied, and the suction cup is moved away with the media sheet held thereto by suction. As is illustrated in Figure 1, a cam member 104 bearing a cam track 103 is used to control the motion of an arm 108 on which is mounted a suction cup 106. The cam member 104 is arranged to rotate in one direction to bring the suction cup 106 into contact with an item of sheet media, to form a tight seal therewith and apply a vacuum. The continued rotation of the cam member 104 lifts the sheet media away from the stack using suction and feed it into a transport mechanism 128 comprising rollers. The suction is released to allow the media to be carried away by the rollers.

[0003] A problem associated with the prior art is that a particular cam is required for a particular media for the following reasons.

[0004] Taking the example of an Automated Teller Machine (ATM), in which the media comprises currency notes, most ATMs include a plurality of pick mechanisms so that different denominations of currency notes can be dispensed from stacks of notes of that denomination. In the UK, typically four modules are provided, two of which may be dedicated to picking from stacks of twenty-pound notes and the other two of which may be dedicated to picking from stacks of ten-pound notes. In order that notes can be dispensed, each module has a separate pick mechanism. The desirable shape for a cam track is determined according to the sheet media. In an ATM, the suction cup 106 must be held against a note with enough force and for long enough to form a good seal behind which a partial vacuum is formed.

However, it is desirable that the notes are dispensed quickly and it is important that the suction cup 106 is not held against a stack of note for so long that two notes are picked up. If a pick module is to be re-tasked to deal with different media, the cam member 104 must usually be replaced.

[0005] The prior art mechanism is also limited in that there is little control over the pick action otherwise known as the pick cycle. For example, the force of contact with the sheet media and the length of time for which contact is held in order to form a seal is a function of the cam track 103 used. If there is a 'pick failure', which may for example occur if there is a hole in sheet media so that a vacuum is not formed, or the sheet media becomes jammed within its cassette, then the same pick action will simply repeat, with little extra chance of success.

[0006] According to a first aspect of the present invention, there is provided a pick mechanism for picking sheet media, the mechanism comprising control circuitry, a motor and a pick means, wherein the motor is arranged to move the pick means in order to pick sheet media and the control circuitry is arranged to determine a pick action and to control the motor such that the pick means follows the determined pick action.

[0007] This is advantageous as the pick mechanism is able to adapt to provide different pick action for picking media as required and therefore a pick mechanism could be re-tasked without requiring replacement of any physical element of the mechanism. Additionally, a machine built to one specification, with identical hardware parts, may be used with a variety of media. This simplifies production of pick mechanism. In effect, the invention provides a 'software' cam, which can be altered by the control circuitry in place of the prior art physical cam.

[0008] In one embodiment, the pick action is determined according to characteristics of the sheet media with which the pick mechanism is intended to operate. The characteristics may be one or more of the following: density of media, substrate, weight of media, quality of media, dimensions or the like. Even considering a limited media type such as currency, there can be significant variations within a single currency type in terms of the sizes and weights of notes. Between different countries, differences in note type are more marked. For example, Japanese currency is shiny and resists attachment to suction cups. US currency is more readily picked up by suction cups.

[0009] Preferably, the control circuitry is arranged to determine a new pick action following a failed pick attempt. The new pick action may comprise one or more of: holding the pick means against the sheet media for longer, holding the pick means against the sheet media with greater pressure than in failed pick attempt, agitating the sheet media with the pick means. This is an improvement over the prior art in that, in prior art machines, the shape of the cam shaft defined the pick action and therefore a new pick action could only be implemented by changing the cam. This is not practical following each failed pick attempt (which may, for example, be due to a tear in a note rather than a poorly chosen cam track).

[0010] Preferably, the motor is a stepping motor. Such a motor provides an advantage over prior art Direct Current (DC) motors as its action may be more precisely controlled.

[0011] According to a second aspect of the present invention, there is provided a method of picking sheet media including performing a first pick action and, if the action is unsuccessful, performing a second pick action.

[0012] This is advantageous as it provides the possibility of varying the pick action in response to occasional pick failures due to, for example, a hole in an item of sheet media or an item of sheet media becoming trapped within a dispensing mechanism.

[0013] The second pick action may vary from the first

pick action in the force with which a pick means is held against an item of sheet media, the length of time for which it is held there, movement of the pick means once in contact with the pick means or the like.

[0014] Preferably, a pick action is carried out by applying a waveform to a motor. This is advantageous as it provides an easily modified pick action control means. In a preferred embodiment the motor is a stepper motor. A stepper motor is more precisely controllable than other forms of motor such as a DC motor.

[0015] The method may be implemented by the pick mechanism of the first aspect of the invention.

[0016] According to a third aspect of the invention, there is provided an Automated Teller Machine comprising at least one pick mechanism according to the first aspect of the invention.

[0017] Embodiments of the present invention will now be described, by way of example only, and with reference to the accompanying drawings, of which

Figure 1 shows a prior art cash machine pick mechanism;

Figure 2 shows a cash machine pick mechanism according to one embodiment of the present invention; and

Figure 3 shows an example of a waveform that the control circuitry of a pick mechanism according to one embodiment of the present invention.

[0018] Figure 1 shows a prior art of a cash machine pick mechanism 100 comprising a pick means 102 arranged to pick currency notes held in a cash cassette 101. The pick means 102 comprises a suction cup 106 which is mounted on a pivoting arm 108. The suction cup 106 is connected to a pump (not shown). The pivoting arm 108 is mounted eccentrically to a point 114 on a rotating disc 116, which comprises also a gear section 118. The mechanism further comprises a cam member 104 bearing a cam track 103.

[0019] A driver arm 112 is mounted at a biased mounting point 113 within the mechanism 100, which urges the driver arm 112 towards the centre of the cam member 104. The driver arm 112 comprises a stud 115 which co-operates with the cam track 103 and a driver gear section 117 which co-operates with the gear section 118 of the rotating disc 116. The cam member 104 is arranged to rotate in one direction to bring the suction cup 106 into contact with an item of sheet media, to form a tight seal therewith and apply a vacuum. The continued rotation of the cam member 104 lifts the sheet media away from the stack using suction and feeds it into a transport mechanism 128 comprising rollers.

[0020] The mechanism 100' of Figure 2, in which features in common with Figure 1 are labeled with like numbers, comprises a stepper motor 200 controlled by control circuitry 202. The stepper motor 200 acts on the stud 115

of the driver arm 112.

[0021] In use of the mechanism 100', the control circuitry 202 applies a pick action as a waveform 300, such as that shown in Figure 3, to the motor 200. The waveform 300 has been determined according to the intended media type to be dispensed (usually currency, so this will include a consideration of the note type in that country, and the denomination that the unit 100 is expected to dispense).

[0022] The waveform 300 includes a first section, an approximately linear wave, increasing with time or with rotation of the motor, section A, which when applied to the motor 200 results in the suction cup being brought into contact with the sheet media. The steepness of this section represents the force with which the suction cup 106 hits the sheet media and the height of this section determines how hard the suction cup 106 is held against the sheet media. A second section B is approximately flat, providing the length of time that the suction cup 106 is held against the media whilst the partial vacuum is formed.

[0023] When a media sheet is requested, the motor 200 acts on the stud 115 moving the driven arm 112. The control circuitry 202 causes the motor 200 to control the displacement of the stud 115 against the bias of the driven arm 112 and according to the wave form shown in Figure 3. As the stud 115 is raised, the driver gear section 117 co-operates with the gear section 118 on the rotating disc 116, causing the point 114 at which the pivoting arm 108 is held to move such that the suction cup 106 is first brought into contact with the uppermost sheet in a stack of sheets stored in the cash tray then held there while a partial vacuum is formed by the pump. The motor then allows the stud 115 to lower under the action of the bias and the gear portion 118 on the rotating disc 116 moves the suction cup 106 away from the cash tray with the sheet held thereto by suction.

[0024] The sheet is then transported into the transfer mechanism 128 and carried away, for example in order to be dispensed to a user of the cash machine.

[0025] In the event that a pick attempt fails (i.e. the sheet is not carried away by the suction cup 106), the control circuitry 202 determines a new pick action and produces a waveform 300 corresponding to that pick action to be applied to the motor 200. This waveform 300 will hold the suction cup 106 against the sheet for longer (i.e. section B of the wave form will be longer) and with more pressure (i.e. section A will be steeper and end higher). If this attempt fails, a further waveform is calculated. This waveform will include an oscillating portion in section B, where the suction cup is against the sheet in an attempt to agitate the sheet, which may have become stuck.

Claims

1. A pick mechanism for picking sheet media compris-

ing control circuitry, a motor and a pick means, wherein the motor is arranged to move the pick means such that it can pick sheet media and the control circuitry is arranged to determine a pick action and to control the motor such that the pick means follows the determined pick action.

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2. A pick mechanism according to claim 1 in which the pick action is determined according to characteristics of the sheet media with which the pick mechanism is intended to operate. 10
3. A pick mechanism according to claim 2 in which the characteristics comprise one or more of the following: density of media, substrate, weight of media, quality of media, dimensions. 15
4. A pick mechanism according to any preceding claim, in which the control circuitry is arranged to determine a new pick motion plan following a failed pick attempt. 20
5. A pick mechanism according to any preceding claim, in which the new pick motion plan comprises one or more of: holding the pick means against the sheet media for longer, holding the pick means against the sheet media with greater pressure than in a failed pick attempt, agitating the sheet media with the pick means. 25
6. A pick mechanism according to any preceding claim, in the motor is a stepping motor. 30
7. An Automated Teller Machine comprising at least one pick mechanism for picking sheet media comprising control circuitry, a motor and a pick means, wherein the motor is arranged to move the pick means such that it can pick sheet media and the control circuitry is arranged to determine a pick action and to control the motor such that the pick means follows the determined pick action. 35
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8. An Automated Teller Machine according to claim 7 in which the pick action is determined according to characteristics of the sheet media with which the pick mechanism is intended to operate. 45
9. An Automated Teller Machine according to claim 8 in which the characteristics comprise one or more of the following: density of media, substrate, weight of media, quality of media, dimensions. 50
10. An Automated Teller Machine according to claim 7 in which the control circuitry is arranged to determine a new pick motion plan following a failed pick attempt. 55
11. An Automated Teller Machine according to claim 7 in which the new pick motion plan comprises one or more of: holding the pick means against the sheet

media for longer, holding the pick means against the sheet media with greater pressure than in a failed pick attempt, agitating the sheet media with the pick means.

12. An Automated Teller Machine according to claim 7 in the motor is a stepping motor.

FIG. 1
PRIOR ART

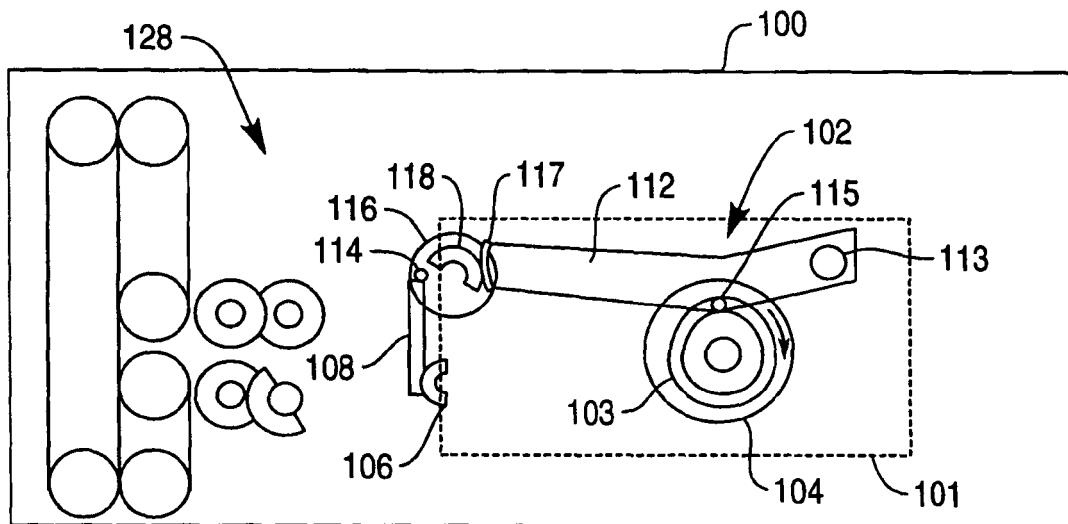


FIG. 2

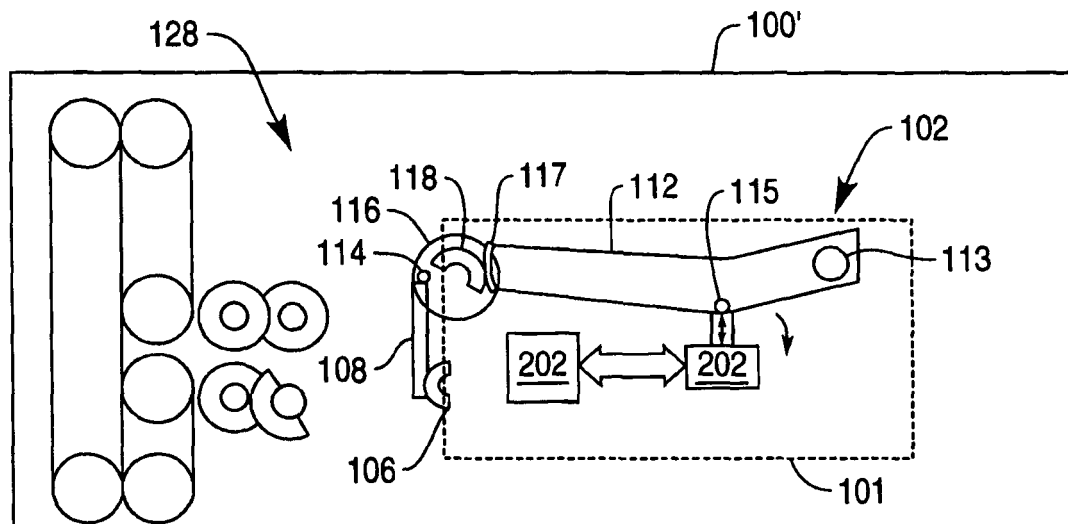


FIG. 3

